# Magnetoactive elastomers of mixed content: magnetic properties and bending deflection

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The results of theoretical and experimental investigations of the polymer composites that belong to a class of magnetoactive elastomers with mixed magnetic content (MAEs-MC) are presented. The distinction of such composites from ordinary magnetoactive elastomers is that the magnetic filler of MAEs-MC comprises both magnetically soft (MS) particles of size 3-5 μm and magnetically hard (MH) particles whose size is an order of magnitude greater. The 'initiation' process of a synthesised MAE-MC is done by its magnetisation in a strong magnetic field that imparts to the sample unique magnetic and mechanical properties.

It is shown that the presence of MS particles around larger MH particles, firstly, causes an augmentation of magnetic moments, which the MH particles acquire during initiation, and secondly, enhances the magnetic susceptibility and remanent magnetisation of MAEs-MC. These magnetic parameters are evaluated on the basis of the macroscopic magnetostatics from the experimental data of spatial scanning of the field over the space around MAEs-MC made in the shape of a spheroid. A set of samples with a fixed MH and varying MS volume contents that are initiated in two different fields, is used. The developed mesoscopic model of magnetic interactions between the MH and MS phases is able to explain the experimentally observed dependencies of the magnetic parameters on the concentration of the MS phase. The combined interplay of these phases defines the resulting material properties of MAEs-MC on the macroscopic scale. In this context, the bending deformation of MAE-MC cantilevers initiated along the length axis is studied experimentally in a uniform magnetic field. The results show great potential of this smart material in terms of designing actuator and gripper applications.

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